IN THE CLAIMS:

Please amend the claims as follows:

What is claimed is:

1. (Previously presented) An isolated and purified biologically active heparan sulfate 3-*O*-sulfotransferase 5 polypeptide having greater than 95% sequence identity to SEQ ID NO 2.

2. (Currently amended) The isolated and purified, biologically active heparan sulfate 3-*O*-sulfotransferase 5 polypeptide of claim 1, wherein the polypeptide comprises a polypeptide selected from the group consisting of:

(a) a polypeptide encoded by a nucleic acid sequence as set forth in SEQ ID NO 1; and

~~(b) a polypeptide encoded by a nucleic acid sequence having greater than 95% sequence identity to SEQ ID NO 1;~~

~~(c)~~(b) a polypeptide having an amino acid sequence as set forth in SEQ ID NO 2~~; and~~

~~(d) a polypeptide encoded by a nucleic acid molecule capable of hybridizing under stringent conditions to a nucleic acid molecule comprising the nucleotides of SEQ ID NO 1, or a complement thereof~~.

3. (Previously presented) The polypeptide of claim 1, wherein the polypeptide is a human heparan sulfate 3-*O*-sulfotransferase 5 polypeptide.

4. (Previously presented) The polypeptide of claim 1, wherein the polypeptide is modified to be in detectably labeled form.

5. (Withdrawn) An isolated and purified antibody capable of specifically binding to the polypeptide of claim 1.

6. (Withdrawn) An isolated and purified nucleic acid molecule encoding a biologically active heparan sulfate 3-*O*-sulfotransferase 5 polypeptide.

7. (Withdrawn) The nucleic acid molecule of claim 6, wherein the encoded polypeptide comprises a human heparan sulfate 3-*O*-sulfotransferase polypeptide.

8. (Withdrawn) The nucleic acid molecule of claim 6, wherein the nucleic acid molecule is a nucleic acid sequence having greater than 90% sequence

identity to SEQ ID NO 1.

9. (Withdrawn) The nucleic acid molecule of claim 8, wherein the nucleic acid molecule has a nucleic acid sequence as set forth in SEQ ID NO 1.

10. (Withdrawn) The nucleic acid molecule of claim 6, wherein the encoded polypeptide comprises an amino acid sequence as set forth in SEQ ID NO 2.

11. (Withdrawn) The nucleic acid molecule of claim 6, further defined as positioned under the control of a promoter.

12. (Withdrawn) The nucleic acid molecule of claim 111, wherein the nucleic acid molecule is a DNA segment, and the DNA segment and promoter are operationally linked in a recombinant vector.

13. (Withdrawn) A recombinant host cell comprising the nucleic acid molecule of claim 6.

14. (Withdrawn) A transgenic non-human animal having incorporated into its genome a xenogeneic nucleic acid molecule encoding a biologically active heparan sulfate 3-*O*-sulfotransferase 5 polypeptide, the nucleic acid molecule being present in the genome in a copy number effective to confer expression in the animal of the heparan sulfate 3-*O*-sulfotransferase 5 polypeptide.

15. (Withdrawn) A method of producing an antibody immunoreactive with a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide, the method comprising:

(a) transfecting a recombinant host cell with a nucleic acid molecule of claim 6, which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide;

(b) culturing the host cell under conditions sufficient for expression of the polypeptide;

(c) recovering the polypeptide; and

(d) preparing an antibody to the polypeptide.

16. (Withdrawn) The method of claim 15, wherein the nucleic acid molecule comprises a nucleic acid molecule sequence as set forth in SEQ ID NO 1.

17. (Withdrawn) A method of detecting a heparan sulfate 3-*O*-sulfotransferase polypeptide, the method comprising immunoreacting the polypeptide with an antibody prepared according the method of claim 15 to form an antibody-polypeptide conjugate; and detecting the conjugate.

18. (Withdrawn) A method of detecting a nucleic acid molecule that encodes a heparan sulfate 3-*O*-sulfotransferase polypeptide in a biological sample containing nucleic acid material, the method comprising:

(a) hybridizing the nucleic acid molecule of claim 8 under stringent hybridization conditions to the nucleic acid material of the biological sample, thereby forming a hybridization duplex; and

(b) detecting the hybridization duplex.

19. (Withdrawn) An assay kit for detecting the presence of a heparan sulfate 3-*O*-sulfotransferase polypeptide in a biological sample, the kit comprising a first antibody capable of immunoreacting with a polypeptide of claim 1.

20. (Withdrawn) The assay kit of claim 19, further comprising a second container containing a second antibody that immunoreacts with the first antibody.

21. (Withdrawn) The assay kit of claim 20, wherein the first antibody and the second antibody comprise monoclonal antibodies.

22. (Withdrawn) The assay kit of claim 20, wherein the first and second antibodies each comprise an indicator.

23. (Withdrawn) The assay kit of claim 22, wherein the indicator is a radioactive label or an enzyme.

24. (Withdrawn) An assay kit for detecting the presence, in a biological sample, of an antibody immunoreactive with a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide, the kit comprising a polypeptide of claim 1 that immunoreacts with the antibody, with the polypeptide present in an amount sufficient to perform at least one assay.

25. (Withdrawn) An assay kit for detecting the presence, in biological samples, of a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide, the kit comprising a first container that contains a nucleic acid molecule identical or

complementary to a segment of at least ten contiguous nucleotide bases of the nucleic acid molecule of claim 6.

26. (Withdrawn) A method of screening candidate substances for an ability to modulate heparan sulfate 3-*O*-sulfotransferase 5 biological activity, the method comprising:

(a) establishing test samples comprising a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide;

(b) administering a candidate substance to the test samples; and

(c) measuring the interaction, effect, or combination thereof, of the candidate substance on the test sample to thereby determine the ability of the candidate substance to modulate heparan sulfate 3-*O*-sulfotransferase 5 biological activity.

27. (Withdrawn) The method of claim 26, wherein the candidate substance is further characterized as a candidate polypeptide, and further comprising the step of purifying and isolating a gene encoding the candidate polypeptide.

28. (Withdrawn) The method of claim 27, wherein the polypeptide is contained within cells in cell culture.

29. (Withdrawn) A recombinant cell line suitable for use in the method of claim 28.

30. (Withdrawn) A method of modulating heparan sulfate 3-*O*-sulfotransferase 5 biological activity in a vertebrate subject, the method comprising the step of administering to the vertebrate subject an effective amount of a substance capable of modulating activity of a heparan sulfate 3-*O*-sulfotransferase polypeptide in the vertebrate subject to thereby modulate heparan sulfate 3-*O*-sulfotransferase 5 biological activity in the vertebrate subject.

31. (Withdrawn) The method of claim 30, wherein the substance that modulates the heparan sulfate 3-*O*-sulfotransferase activity comprises an anti- heparan sulfate 3-*O*-sulfotransferase 5 antibody.

32. (Withdrawn) The method of claim 30, wherein the step of administering

further comprises administering an effective amount of a substance that modulates expression of a heparan sulfate 3-*O*-sulfotransferase 5-encoding nucleic acid molecule in the vertebrate.

33. (Withdrawn) The method of claim 32, wherein the substance that modulates expression of the heparan sulfate 3-*O*-sulfotransferase 5-encoding nucleic acid molecule comprises an antisense oligonucleotide.

34. (Withdrawn) The method of claim 30, wherein the vertebrate subject is a mammal.

35. (Withdrawn) A composition comprising an effective amount of a modulator of a biological activity of a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide, and a pharmaceutically acceptable diluent or vehicle.

36. (Withdrawn) The composition of claim 35, wherein the heparan sulfate 3-*O*-sulfotransferase 5-biological-activity-modulator is selected from the group consisting of:

(a) a purified antibody which preferentially binds heparan sulfate 3-*O*-sulfotransferase 5, or a fragment or derivative thereof, and

(b) a polypeptide which interacts with heparan sulfate 3-*O*-sulfotransferase 5, or a fragment or derivative thereof.

37. (Withdrawn) A method for modulating transfer of sulfate to the 3-OH position of a glucosamine residue of heparan sulfate in a vertebrate subject, the method comprising introducing to a target tissue producing heparan sulfate in the vertebrate subject a construct comprising a nucleic acid sequence encoding a heparan sulfate 3-*O*-sulfotransferase 5 gene product operatively linked to a promoter, wherein production of the heparan sulfate 3-*O*-sulfotransferase 5 gene product in the target tissue results in modulation of transfer of sulfate to the 3-OH position of a glucosamine residue of heparan sulfate.

38. (Withdrawn) The method of claim 37, wherein the construct further comprises a vector selected from the group consisting of a plasmid vector or a viral vector.

39. (Withdrawn) The method of claim 37, wherein the construct further

comprises a liposome complex.

40. (Withdrawn) The method of claim 37, wherein the heparan sulfate 3-*O*-sulfotransferase 5 gene product comprises a protein having an amino acid sequence as set forth in SEQ ID NO 2.

41. (Withdrawn) The method of claim 37, wherein the nucleic acid sequence is selected from the group consisting of:

(a) a DNA acid sequence as set forth in SEQ ID NO 1, or its complementary strands;

(b) a DNA sequence which hybridizes to a nucleic acid sequence as set forth in SEQ ID NO 1 under wash stringency conditions represented by a wash solution having about 200 mM salt concentration and a wash temperature of at least about 45°C, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide; and

(c) a DNA sequence differing from an isolated nucleic acid molecule of (a) or (b) above due to degeneracy of the genetic code, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide encoded by the isolated nucleic acid molecule of (a) or (b) above.

42. (Withdrawn) The method of claim 37, wherein the target tissue comprises muscle tissue.

43. (Withdrawn) A method for modulating production of 3-*O*-sulfated heparan sulfate in a vertebrate subject, the method comprising introducing to a target tissue comprising cells producing heparan sulfate in said vertebrate subject a construct comprising a nucleic acid sequence encoding a heparan sulfate 3-*O*-sulfotransferase 5 gene product operatively linked to a promoter, wherein production of the heparan sulfate 3-*O*-sulfotransferase 5 gene product in the target tissue results in modulation of production of 3-*O*-sulfated heparan sulfate.

44. (Withdrawn) The method of claim 43, wherein the 3-*O*-sulfated heparan sulfate is an anticoagulant-active heparan sulfate.

45. (Withdrawn) The method of claim 44, wherein the 3-*O*-sulfated heparan sulfate is an antithrombin-binding heparan sulfate.

46. (Withdrawn) The method of claim 43, wherein the 3-*O*-sulfated heparan sulfate is an entry receptor for HSV-1.

47. (Withdrawn) The method of claim 43, wherein the 3-*O*-sulfated heparan sulfate is both an anticoagulant-active heparan sulfate and an entry receptor for HSV-1.

48. (Withdrawn) The method of claim 43, wherein the 3-*O*-sulfated heparan sulfate comprises a disaccharide selected from the group consisting of:

(a) L-iduronic acid 2-*O*-sulfate-2,5,-anhydromannitol 3-*O*-sulfate;

(b) D-glucuronic acid-2,5,-anhydromannitol 3,6-*O*-sulfate;

(c) L-iduronic acid 2-*O*-sulfate-2,5,-anhydromannitol 3,6-*O*-sulfate;

(d) L-iduronic acid-2,5-anhydromannitol 3,6-*O*-sulfate;

(e) L-iduronic acid-2,5-anhydromannitol 3-*O*-sulfate;

(f) D-glucuronic acid-2,5-anhydromannitol 3-*O*-sulfate;

(g) $\Delta^{4,5}$-uronic acid-glucosamine *N*,3-disulfate; and

(h) $\Delta^{4,5}$-uronic acid-glucosamine *N*-sulfate-iduronic acid 2-sulfate-glucosamine 3,6-disulfate.

49. (Withdrawn) The method of claim 43, wherein the construct further comprises a vector selected from the group consisting of a plasmid vector or a viral vector.

50. (Withdrawn) The method of claim 43, wherein the construct further comprises a liposome complex.

51. (Withdrawn) The method of claim 43, wherein the heparan sulfate 3-*O*-sulfotransferase 5 gene product comprises a protein having an amino acid sequence as set forth in SEQ ID NO 2.

52. (Withdrawn) The method of claim 43, wherein the nucleic acid sequence is selected from the group consisting of:

(a) a DNA acid sequence as set forth in SEQ ID NO 1, or its complementary strands;

(b) a DNA sequence which hybridizes to a nucleic acid sequence as set forth in SEQ ID NO 1 under wash stringency conditions represented by a wash solution having about 200 mM salt concentration and a wash

temperature of at least about 45°C, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide; and

(c) a DNA sequence differing from an isolated nucleic acid molecule of (a) or (b) above due to degeneracy of the genetic code, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide encoded by the isolated nucleic acid molecule of (a) or (b) above.

53. (Withdrawn) The method of claim 43, wherein the target tissue comprises muscle tissue.

54. (Withdrawn) A method for increasing the efficacy of treating a disorder using a virus vector for delivering therapeutic nucleic acid molecules to the cells of a subject, comprising administering to the subject a construct comprising a nucleic acid sequence encoding a heparan sulfate 3-*O*-sulfotransferase 5 gene product operatively linked to a promoter prior to administration of the virus vector, wherein production of the heparan sulfate 3-*O*-sulfotransferase 5 gene product in the cells results in increased expression of 3-*O*-sulfated heparan sulfate, and wherein the 3-*O*-sulfated heparan sulfate is an entry receptor for the virus vector.

55. (Withdrawn) The method of claim 54, wherein the 3-*O*-sulfated heparan sulfate comprises a disaccharide selected from the group consisting of:

(a) L-iduronic acid 2-*O*-sulfate-2,5,-anhydromannitol 3-*O*-sulfate;

(b) D-glucuronic acid-2,5,-anhydromannitol 3,6-*O*-sulfate;

(c) L-iduronic acid 2-*O*-sulfate-2,5,-anhydromannitol 3,6-*O*-sulfate;

(d) L-iduronic acid-2,5-anhydromannitol 3,6-*O*-sulfate;

(e) L-iduronic acid-2,5-anhydromannitol 3-*O*-sulfate;

(f) D-glucuronic acid-2,5-anhydromannitol 3-*O*-sulfate;

(g) $\Delta^{4,5}$-uronic acid-glucosamine *N*,3-disulfate; and

(h) $\Delta^{4,5}$-uronic acid-glucosamine *N*-sulfate-iduronic acid 2-sulfate-glucosamine 3,6-disulfate.

56. (Withdrawn) The method of claim 54, wherein the construct further comprises a vector selected from the group consisting of a plasmid vector or a viral vector.

57. (Withdrawn) The method of claim 54, wherein the construct further comprises a liposome complex.

58. (Withdrawn) The method of claim 54, wherein the heparan sulfate 3-*O*-sulfotransferase 5 gene product comprises a protein having an amino acid sequence as set forth in SEQ ID NO 2.

59. (Withdrawn) The method of claim 54, wherein the nucleic acid sequence is selected from the group consisting of:

(a) a DNA acid sequence as set forth in SEQ ID NO 1, or its complementary strands;

(b) a DNA sequence which hybridizes to a nucleic acid sequence as set forth in SEQ ID NO 1 under wash stringency conditions represented by a wash solution having about 200 mM salt concentration and a wash temperature of at least about 45°C, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide; and

(c) a DNA sequence differing from an isolated nucleic acid molecule of (a) or (b) above due to degeneracy of the genetic code, and which encodes a heparan sulfate 3-*O*-sulfotransferase 5 polypeptide encoded by the isolated nucleic acid molecule of (a) or (b) above.

60. (Withdrawn) The method of claim 54, wherein the virus vector is a HSV-1 vector.